

REMARKS

Claims 1-6 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,566,260 ("Chooi") in view of U.S. Patent No. 6,413,879 ("Maeda"). In response, claims 1-2 have been cancelled and claims 3-6 have been amended. Claims 3-6 are pending. Support for all amendments to the specification and claims appears at pages 5-7 of the application as filed and in FIGS. 2A-2D.

Independent claims 4 and 6 recite a method for burying or filling pores on sidewalls of the via hole when the via hole extends through a porous film to an underlying base layer.

The Patent Office alleges that Chooi teaches "step b) depositing a CVD TiN film on the entire structure including the via hole; implementing a plasma treatment process using N₂ + H₂; and d) repeatedly implementing the deposition process at column 10, lines 6-22." However, at column 10, lines 6-22 of Chooi, Chooi makes it clear that the plasma treatment is carried out to form a "pseudo-carbon nitride" layer on the surface of the dielectric layer.

In contrast, the plasma treatment of claims 4 and 6 is employed to reduce the CVD TiN film and the MOTiN on the structure except the pores. Namely, the plasma treatment is not to form the pseudo-carbon nitride but to reduce the CVD TiN film presence on the sidewalls of the via hole except for the pores thereby filling the pores on the sidewall of the via hole. Also, Chooi does not teach or even suggest that the steps of depositing the CVD TiN film and implementing the plasma treatment process are *repeatedly* implemented.

Also, the Examiner asserts that Chooi teaches the CVD TiN film is formed in thickness of 10 Å to 20 Å at column 6, lines 1-2. However, as described at column 6, lines 1-2 of Chooi, the metallic barrier layer is formed to a thickness of between 50 angstroms and 3000 angstroms, outside the range of 10 Å to 20 Å of claims 3 and 5. Further, the CVD TiN film of claim 4 is formed in a thickness of 10 Å to 20 Å, different from that of Chooi, to bury or fill only the pores on the sidewalls of the via hole not to form a barrier metal layer on sidewalls of the via hole as taught by Chooi. As recited in claims 4 and 6, after the pores on the sidewalls of the via hole are filled or buried, then the metal barrier layer is formed.

The Patent Office then asserts that the Maeda teaches "b) burying pores of the sidewall of the via hole with a CVD TiN film; and c) forming a barrier metal on the entire structure including the via at column 30, lines 26-33."

However, as described at column 30, lines 26-33 (Claim 17) of Maeda, the metallic film is buried in damascene trench, and Claim 17 of Maeda does not teach or recite the filling or burying of any pores. Even if Maeda discloses a porous SiO₂ film, Maeda does not teach or even suggest that the pores on the sidewalls of the via hole are buried by repeatedly implementing the steps depositing the CVD TiN film or the MOTiN film and implementing the plasma treatment repeatedly to fill pores and leave the remaining portions of the sidewalls free of the the CVD TiN film or the MOTiN film.

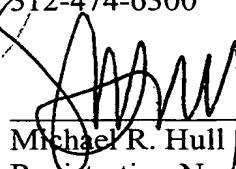
Therefore, the obviousness rejection does not meet the standards of MPEP §§ 2142 and 2143 because the hypothetical combination does not teach or suggest every element of amended claims 4 and 6, and the prior art of record does not suggest the extensive modifications to Chooi and Maeda that would be necessary to formulate a proper obviousness rejection.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Respectfully submitted,

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